In addition to accidental releases of uranium, a number of accidental releases of HF occurred. For example, an analysis was performed in 1975 to explain high gaseous fluoride readings in the ambient air samples. In this occurrence, system failures in the feed plant were attributed to the high readings. Other accidental or unplanned releases have also occurred. For example, several former and current workers interviewed reported blue flames 10 inches high in the classified landfill after a heavy rain.

Diffuse and Fugitive Emissions

Diffuse and fugitive emissions were generally not calculated for the site from 1952 through 1990. A limited set of data exists for releases during the mid-1950s from some processes, such as uranium metal pickling, smoking ash receivers, and drum dryer exhaust. Workplace air samplers and contamination on roofs and ground in the site area point to the occurrence of unmonitored releases. One example is the C-404 Holding Pond. Uranium-contaminated water was originally piped to the pond, and in 1957 the pond was turned into a solid waste burial area. A ramp was later constructed to reduce dust emissions from the area. After the mid-1960s, the ambient air samplers could have reflected some air concentration contributions to diffuse and fugitive emissions. However, no modeling studies were performed to evaluate how those samples might represent these emissions. Also, only low volume samples were taken. This Oversight investigation found no evidence that the performance of the low volume ambient air sampler network was ever evaluated under a variety of wind and weather conditions. There was no evidence that diffuse and fugitive emissions were substantively included in release inventories and subsequent public dose calculations. Also, even though diffuse emissions of transuranics would have occurred during pulverizing of the feed plant receiver ash, no estimates of these emissions were found.

Diffuse and fugitive emissions of fluorides were not calculated for the site from 1952 through 1990. In addition, the investigation team did not have sufficient information to estimate releases of fluorides using the limited set of data for uranium releases during the mid-1950s. However, as discussed under UF_4 and metal production (see Section 3.2.3), the release of fluoride from the production of UF_4 was the probable cause of ecological damage in the areas around C-340.

Planned Releases

Four planned atmospheric releases of UF_6 occurred at PGDP: two 4.4 kg releases in 1955 and two 0.68 kg releases in 1974. These releases were designed to model plume behavior from a surface release and were followed by an additional series of tests where approximately 160 grams of UF_6 was released at ground level directly into the atmosphere. Finally, six releases occurred in the 1975-1976 timeframe, involving a total of approximately 1 kg of UF_6.

As described in Section 3.2.2, there is some evidence that planned releases occurred when preparing the cascade cells for maintenance. Jetting of the cells, possibly to decrease the concentration of uranium in the cells, was accomplished by releasing UF_6 from vents on the roofs of the process building. The frequency and amounts of the releases are unknown. Because a large quantity of uranium could have been involved, jetting of the cascades could be a major contributor to the annual releases. Interviews with the former health physics manager revealed that contaminants jetted to the atmosphere in cascade buildings were not factored into release estimates.

4.5 Environmental Management Summary

The waste management program at the Plant reacted to external requirements. The waste management program that was implemented during the 1980s eventually was able to correct waste activities that had been inadequately managed for years. However, large volumes of waste materials accumulated on site with inadequate characterization for waste classification and disposal. Controls on waste disposal practices were not stringent or fully implemented in the early years of Plant operations, resulting in the creation of numerous disposal sites at the Plant. Additionally, based on employee interviews and a review of procedures and correspondence, it is clear that radiological waste materials were inappropriately disposed of in old and sanitary landfills used at the Plant before the sanitary landfill was permitted by the Commonwealth of Kentucky. Interviews with current and former workers identified locations where waste was discarded around the site from the very early days of operations. With few exceptions, these locations correspond to past landfills, scrap yards, lagoons, and spill sites that have been identified as SWMUs as part

of the current cleanup program under the Federal Facility Agreement.

The Health Physics and Hygiene Department has recognized the need to ensure the proper segregation of clean from contaminated materials prior to their release from the site. However, there were documented problems associated with proper implementation of scrap handling procedures and only a very small number of health physics personnel available to perform radiological surveys. Therefore, it is likely that materials exceeding appropriate radiological release guidelines were sent off site on a routine basis until the late 1980s.

Past liquid effluents have had a significant adverse impact on environmental quality with respect to onsite ditches and streams and groundwater resources in the vicinity of the site. Operations at C-400 produced the most significant radiological effluent, releasing uranium, thorium, and small quantities of fission products and transuranic isotopes in process effluents. Additionally, C-400 operations also released significant amounts of TCE from cleaning operations into the environment, resulting in significant environmental liabilities for the Department. Interviews and documents indicate that from the beginning of Plant operations, Plant personnel made deliberate decisions regarding radioactive effluent releases, with the objective of ensuring acceptable impact on the quality of the Ohio River. Significant efforts were undertaken to improve the quality of area surface waters during the 1970s, consistent with increasing regulatory requirements and an increased sensitivity to environmental protection.

There is evidence that air emissions from 1952 to 1990 exceeded previous estimates. Stack monitoring was not conducted until the mid-1970s; before then, process knowledge was used to estimate potential releases from this pathway. Personnel who performed these estimates acknowledged that these calculations are highly uncertain. It was also acknowledged that other isotopes, such as plutonium and neptunium, could have been released, but based upon the limited quantity, these isotopes were considered to be insignificant contributors to dose. Therefore, these isotopes were not included in published estimates. Process gas releases were common throughout 1952 to 1990, and the potential for these to be vented to the atmosphere was high. The magnitude of these unmonitored releases is unknown. Additionally, unauthorized purging of cascade cell gases through the process of jetting appears likely to have been another significant pathway for unmonitored releases, which have never been estimated or factored into known uncertainties. Given all this, it is apparent that past estimates of public dose have a questionable level of accuracy and conservatism.